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REVIEW.

A SYSTEM OF ALGEBRAIC GEOMETRY. *By the* REV. DIONYSIUS LARDNER. *In Two Volumes. Vol. I. containing the* GEOMETRY OF PLANE CURVES. *8vo. pp. 512. London.*

IN our Magazine for April, in an article on the state of Science in Scotland, we adverted to the splendid advances which have been made in the higher and more difficult parts of Mathematical and Physical Science, since the days of Newton, by the Mathematicians of the Continent; and to the fact, humiliating to our country, that the men of science in Great Britain and Ireland, pursuing a different and a less powerful mode of investigation, fell far behind in the career of discovery which was pointed out by their illustrious countryman. We mentioned, at the same time, that a great revolution had lately taken place in the Universities of Cambridge and Dublin, in which the " new science" is now cultivated with ardour and with every prospect of success. We shall now proceed to offer some more particular remarks on the state of science in Ireland, taking for their basis Mr. Lardner's late work on the " New Geometry."

However we may regret the fact, it must be admitted, that Ireland has produced but few men who have gained distinction in the walks of science. The more eminent of those who have been thus distinguished, were Lord Brouncker, the inventor of the curious and important calculus of continued fractions, and the first President of the Royal Society: William Molyneux, author of a good work on Dioptricks; and his son Samuel, who was connected with Dr. Bradley in the observations that led to the celebrated discovery of the Aberration of Light: Dr. Hugh Hamilton, a Fellow of Dublin College, and afterwards Bishop of Ossory, who was the author of perhaps the best Geometrical Treatise on the Conic Sections that has ever appeared: and Dr. Matthew Young, also a Fellow of Trinity College, and afterwards Bishop of Clonfert. Of less distinction, though still of respectability, were Ronayne, of Cork, the author of a useful old work on Algebra: Helsham, a Fellow of Trinity College, and author of a popular, though now antiquated Treatise on Mechanics: and Wilder, another Fellow, and the author of a Comment on Newton's Universal Arithmetic. Besides those above mentioned, who were chiefly distinguished in pure mathematics, Sir Robert Boyle, Sir Hans Sloane, Mr. Edgeworth, Mr. Kirwan, and some others, were eminent in different branches of Natural Science.

Such a deficiency in scientific fame may appear strange, if we consider the facilities presented by Dublin College in the entire sphere of its influence. With ample endowments, and an extensive library, it has at present a Provost, seven senior, and eighteen junior Fellows, and a distinct Professor of Astronomy. These Fellows are elected after an examination which is remarkable for its difficulty, and the emoluments are such as to produce great competition, and remarkable exertions in making the requisite preparation. This examination turns in such a degree on Mathematics and Natural Philosophy, that scarcely any person can be appointed without a considerable knowledge of at least the elementary parts of these subjects: and the knowledge thus acquired is not allowed to be lost, as every junior Fellow, as long as he holds his situation, is constantly employed, as tutor, in instructing his pupils in these branches, as well as in every other part of the under-graduate course, or course of education which is prescribed for obtaining a Bachelor's degree. The College has also in its gift, we believe, eighteen Church benefices, on which the Fellows retire, and thus leave vacancies for others: and Fellows are also not unfrequently exalted to other situations in the Church, such as Rectories, Deaneries, or Bishoprics. Hence, we shall not be far from the truth in stating, that from these causes, as well as from persons occasionally vacating their Fellowships from other reasons, there are at all times in Ireland about fifty individuals who either are or were Fellows. Besides these, there are perhaps a hundred who have studied for Fellowships, but who, from changing their views, or from other causes, have not been elected. A considerable number of these are both of high talents and learning; and many of them employ themselves in teaching—often with great respectability and usefulness. To all these we may add numerous individuals, who, though they have obtained a less extensive College education in science, have yet been educated in such a manner as to be able to proceed successfully in the study, if circumstances or inclination should direct their attention to it at a subsequent period.

From these views, it will appear that there must be at all times in this country a large number of persons, whose education would prepare them for making great advances in mathematical and physical science, and would enable them, according to their talents, to make new discoveries: and we are naturally led to inquire into the causes which prevent the results that might be anticipated. These causes are chiefly to be traced to the constitution and management of the University of Dublin, which has naturally an overpowering influence on the learning of the nation. The junior Fellows, though they have generally laid a good foundation for future success in the cultivation of science, are so much occupied with the duties of their laborious situations, that unless they have a strong and decided taste for some particular study, and high talents for its prosecution, little can be expected from their exertions as authors. Dr. Robinson, formerly a Fellow, and now the Astronomer in the Observatory of Armagh, complains, in the preface to his work on Mechanics, published in 1820, before he left the College, that—

> " Under the system pursued at present in Trinity College, its Fellows can scarcely be expected to devote themselves to any work of research, or even of compilation; constantly employed in the duties of tuition, which harass the mind more than the most abstract studies, they can have but little inclination, at the close of the day, to commence a new career of labour. How different is this from the state of the English Universities, where the tutors constitute a very small part of the body, and the remainder have both leisure and incitement to pursue their peculiar studies, and increase the literary fame of their Alma Mater by their publications. In the present case the author happened to be less occupied than most of his brethren, yet he was engaged from seven to eight hours daily in Academical duties for the year during which he composed this work."

Such is the account given by a person of high talents and learning, and who had the best means of forming a correct judgment on the subject. Besides this, each of the junior Fellows is required to teach every part of the under-graduate course; and the person who, in the same day, is obliged to instruct pupils in Latin, Greek, Logic, Ethics, Mathematics, and Physics, has much less chance to excel either as a teacher or an author, than a person whose attention is directed only to some one of these branches, and whose official duties occupy only one or two hours daily for half of the year, as is the case in the Universities of Scotland.

Another cause of the deficiency which we are considering, and one of perhaps more weight than it would at first seem to possess, is the want of attention to the elegances and graces of style, in the works which issue from Trinity College. While in the Scotch Colleges, the student is inured during his whole course to express his ideas with correctness in the native language, and taught to regard this as one of the most important objects of attention; the student of Dublin College is not required, from the day that he enters the seminary, to compose even the shortest theme in the English tongue. Hence, born like his Scotish neighbour, in a provincial situation, accustomed from his cradle to the use of an inaccurate dialect, and never awakened to a sense of his own defects, he acquires knowledge in his College course, which he is unable to embody in words; and his compositions, whatever learning they may exhibit, are often destitute of every external qualification, that would recommend them to the attention of the polite scholar. It would be an easy, but an invidious task, to adduce instances in support of these remarks, from publications that have lately issued from that seminary.

In such a state of things, we can readily conceive even an extensive seminary, plunged into a kind of somnolency, and each generation treading with almost undeviating exactness in the footsteps of those that went before it. A man who is obliged to teach eight or nine hours daily, will naturally shudder at the idea of entering on a new course of study, whatever improvements may have been introduced around him: and the persons with whom the appointments of new colleagues rests, will elect those candidates of whose qualifications they are best able to judge. Hence, the aspirants after office and distinction, easily ascertaining the course which they are to pursue to please their examiners, will attend to the older treatises, and thus obtain their situations, with a degree of knowledge, and with a train of ideas, well calculated to perpetuate the existing system, however far it may have fallen behind in the march of improvement and discovery, through the various parts of the literary and scientific world.

In such a state of inactivity, however, the energy, the industry, or the genius of an individual, may awake the slumbering powers, to new and vigorous action: and Dr. Lloyd, one of the Fellows of Dublin College, began, about the year 1812, an entire revolution in the state of science in that seminary. The reader will be enabled to appreciate the extent and value of the reform introduced by this gentleman, from the following account of the state of science in Dublin, before his time, and of its present state, taken from the introduction to the work before us, p. xxxvii.

" Students in Dublin must be four years in the University before they become candidates for the degree of Bachelor. Of this time, ten months were spent in the acquisition of the first, second, third, and sixth books of Euclid. These constituted the entire mathematical knowledge expected even from the candidates for the highest Academical honours. A short selection of Mechanics, taken from an old treatise, by Helsham, accompanied by a popular introductory pamphlet to Natural Philosophy (both replete with errors), a very few of the first elementary principles of Optics, and a selection from Keill's Astronomy, gave the under-graduate employment for twelve months. The remainder of the course (two years and two months) was divided between the ancient and modern Logic and the Ethics of Cicero and Burlemaqui. Such was the state of the under-graduate course. The mathematical and physical knowledge requisite in candidates for Fellowships, the situations of highest honour and emolument in the University, consisted of Newton's Arithmetic, the properties of Conic Sections, geometrically, Solid Geometry, Keill's Trigonometry, Newton's Optics, and a selection from the PRINCIPIA; Maclaurin's Fluxions were touched upon, but with reserve. Such was actually the state of scientific knowledge, in this national Academy, about the year 1812.

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"Dr. Lloyd, singly and unassisted, conceived and executed the most important and rapid revolution ever effected in the details of a great public Institution. In order to appreciate the benefits derived from his exertions, it will only be necessary to compare the state of science already described, with its state in the present year, 1822. Among the under-graduates, those who now look for high Academical honours, read the works of Cagnoli and Woodhouse, on Trigonometry, Brinkley's Astronomy, a course of Algebraic Geometry, equivalent to the first part of the present treatise; the Elementary Treatise of Lacroix on the Differential, and part of that on the Integral Calculus; with Peacock's Examples as a praxis; a selection from the *Mécanique* of Poisson, including the Statics, the Dynamical principle of D'Alembert, with its various applications; the theory of the moments of inertia, the motion of a body round a fixed axis, and most of the Hydrodynamics; also the subject of the first seventeen propositions, and the seventh Section of the PRINCIPIA, and the theory of projectiles *in vacuo*, all treated analytically."

This passage, will afford some idea of the astonishing advances which have been made in the cultivation of science in this seminary, in a very few years; and the great number of works to which the change thus effected, has given origin, will still farther illustrate the subject. Among these may be mentioned, a Treatise on Analytic Geometry, published by Dr. Lloyd in 1819, and modelled after the Treatises of Lacroix, and other foreign writers on the same subject. This was, we believe, the first work of the kind ever published in the English language: and gratitude is due to the author for having thus introduced the subject to his countrymen in their own language. In 1820, Dr. Robinson published his work on Mechanics, in which the subject is also treated in the new mode: and though the work, perhaps from haste in its composition, as well as from the shameful manner in which it was printed, has not answered the public expectation, founded on the known abilities of the author, yet it shows an extensive acquaintance with the subject in its most improved form, About two years after, Dr. Wilson, one of the senior Fellows.

published a little known, though creditable work, on Series and Differences; and, about the same time, a Translation of a part of the Mécanique Céleste of Laplace was published by Mr. Harte, one of the junior Fellows, with notes and illustrations. What a progress in improvement does it indicate, that this great magazine of the most astonishing discoveries, this monument of the capabilities and triumphs of the human mind, this astonishing work, which an able writer declared could be read at the time of its publication by scarce a dozen of individuals in England and Scotland, is now read and understood by young men studying for Fellowships in a University in which, a few years ago, it was a sealed book! In 1820, Mr. Lardner, who, though not a Fellow, is an alumnus of the College, and a tutor and examining master, published his Treatise on Central Forces, and in 1823 his Algebraic Geometry: and he has lately announced for publication a Treatise on Trigonometry, and another on the Differential and Integral Calculus. Another Treatise on Trigonometry is also announced by Mr. Luby, lately a candidate for a Fellowship; and a work on Mechanics, by Dr. Lloyd. To these we may also add the "Dublin Problems,' a publication which appeared in 1823. This work contains the questions in science which for some years have been proposed at the principal examinations, and will bear a comparison with the "Cambridge Problems."

Such are the principal treatises* which have issued from this University since the introduction of the new science.—As may be expected, they present great differences in point of execution: at the same time, they are all respectable; and even when some of them may fail in point of style, and other external qualifications, they still prove incontestably that science, in its substantials, is in a very advanced, and in a progressive state in the seminary from which they emanate. We know also that there are at present in the College, and connected with it, several individuals, who are not yet authors, but who possess great abilities, and extensive attainments in science, and who may perhaps yet contribute to the fame of the seminary and of their country.

The only other seminaries in Ireland to which it is necessary to advert, in pursuance of our present design, are the College of Maynooth and the Institution of Belfast. The Dublin and Cork Institutions are of a popular and not of a collegiate character; and, though the kingdom presents many private seminaries of a most respectable nature, we are aware of none that pretends to any thing in science beyond what is elementary.

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* The venerable Dr. Hales, formerly a Fellow, has also written works of Science of great merit; but these were published before the period of which we speak.

With respect to the College of Maynooth, we are informed, on the best authority, that the demand for Roman Catholic Clergymen in Ireland is so urgent, in proportion to the means possessed by the College, that only one Academical year is appropriated to the study of both Mathematics and Natural Philosophy. Our scientific readers will be aware, that in so limited a time students cannot be carried through an extensive course, or made acquainted with the higher parts of these important branches of science; and, accordingly, the very respectable Professor under whose care these branches are at present placed, does not attempt the introduction of the new science, but confines his attention chiefly to the more elementary and useful parts of mathematics and physics according to the methods that have so long been in use in these countries. With all our partialities for the new science, we consider this course decidedly the best in such circumstances. To the learner who studies chiefly for the improvement of his mind, the strict and beautiful reasoning displayed in the ancient geometrical method, and in its applications, should ever form the first object; and, even when the student may have ulterior views, a considerable portion of time should be spent in this way to prepare him for higher pursuits, and for the use of more powerful instruments of investigation.

In the Belfast Institution, the College classes of which have been in operation for ten years, regular Courses of Natural Philosophy and Mathematics are given by two distinct Professors; and a considerable portion of the student's time is devoted to the business of these classes during at least two years of his College course. Even this period, however, is insufficient for attaining much proficiency; and several students, who have taste or talents for this department of study, add a year or two to the time above mentioned. With respect to the courses delivered on these subjects, it may suffice to state, that in the Mathematical Classes, besides Elementary Geometry and Algebra, the students are instructed in Plane and Spherical Trigonometry, the Doctrine of Curves, and the Principles of the Differential and Integral Calculus, with Mensuration and other collateral and minor branches; and in the Natural Philosophy Class, lectures, illustrated by experiments, are delivered on Mechanics, Hydrostatics, Pneumatics, Optics, Astronomy, Electricity, and other subjects usually comprehended in such Courses: and both in this and in the Mathematical Classes, the modern methods of investigation are adopted, as far as the attainments of the students permit.

We have thus far been diverted by the preceding remarks, from entering on a review of Mr. Lardner's work, which appeared to be the avowed object of the present paper. It was by no means our intention, however, to make this our principal object; and we shall touch this part of the subject very briefly, a particular or detailed review of an Algebraic treatise being inconsistent with the nature of our publication.

The volume before us, which is only the first part of the entire work, is divided into twenty-four sections, the first six of which, regard the straight line, and the next eight lines of the second degree. In the remaining sections, we are presented with the method of determining by the calculus the tangents of curves; their rectification and quadrature; their contact and osculation; their curvature, evolutes, and singular points; their general properties, with various other particulars, all illustrated by numerous examples and applications. In the twentieth section also, the nature and properties of the roots and equations are illustrated by the geometry of curves; the twenty-third contains applications of the foregoing part of the work to various parts of physical science; and the twenty-fourth presents a collection of questions without solutions, for exercise to the Student. The work, therefore, contains as much matter as the treatises on Analytic Geometry by the foreign writers, exhibiting the ordinary properties of the straight line, and an ample collection of the properties of the Conic Sections. In addition to this, it presents a curious and interesting mass of information respecting a great number of the most important curves, as well as the general principles of the higher geometry. As a Magazine of information respecting the new geometry, indeed it is not equalled in the English language, and it must be regarded as a great accession to the scientific works of the country. To show how well it is received by persons most competent to judge of its merits, it is only necessary to state, that it is introduced into use in the University of Cambridge, a distinction which it is rare indeed for any Irish publication to obtain.

The investigations throughout the volume are conducted partly by common Algebra, as in other works on Analytic Geometry, and partly by the Differential and Integral Calculus: and are founded on a small number of principles established in the elements of Geometry and in Trigonometry. The processes are of a very general nature, and are in most instances conducted in a very neat and simple manner. The book, as a whole, abounds in examples; and yet we conceive, that a few of the simplest kind might have been introduced with advantage near the beginning. Thus, if in No. 23, particular numerical values with every variety of signs, had been assigned to A, B, C, and A′, B′, C′, as is done by Garnier, and if the Student were instructed to use his compasses and make accurate constructions, we are satisfied, that he would acquire distinct and correct ideas, with more ease, and would have much of the difficulty removed which most learners feel at first, when they study investigation of this kind, entirely in the abstract. In like manner, in Nos. 28 and 29, numerical values should be attached to the quantities A, B, C, x', y', and also to the angles lx and ly; and the same method should be followed in other cases, till such aids will be no longer necessary. We are inclined to think also, that in several other instances, a little more pains might have been taken to adapt the investigations to the capacity of the mere beginner; and simplicity and plainness would have been peculiarly desirable in the first work of general circulation, in which this branch of science is introduced to the English reader, and which should, therefore, render the subject as attractive as possible.*

The style of this treatise, is as much the reverse of that of Professor Leslie's work, which we formerly noticed, as can well be conceived. Here we have no pompous affectation of metaphor, no false ornament; all is plain, simple expression, with such ease and perspicuity, as must please every reader. In a few instances, however, too little attention is paid to those minute accuracies, and to that purity of composition, which are expected in works of the present day. Thus, *vice versa*, *scil.* (*scilicet*) and "that is to say," are inelegant, or superannuated. We have remarked, also, the following inaccuracies:—

"It is generally acknowledged *that*, although Newton did not promulge the method of Fluxions, yet *that* he has the priority as to the invention;" page xxxi. A similar phraseology occurs in page 300. "These, besides *possessing* the student with a large portion," &c. page lii. "This is *equivalent to being given the base*," &c. page 119. "Great changes are generally slowly effected, and produced," &c. page xxxvi. supply *are*. "*Passing* to transcendental curves, the properties are very fully discussed," page lii. Here *passing* has no grammatical connexion with the sentence.

We object to the use of various words and expressions, such as "intercepts," "base angles," "angle of ordination,"

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* In prop. cxxix. page 119, the author has overlooked the case in which the variable circle is touched *internally* by the given circle. In this case the directrix will be on the other side of the given line at a distance equal to C D. Should the directrix pass through C, the parabola would degenerate into a straight line. In the next problem, to which this is also reducible, the locus is merely said to be an hyperbola; while if the one circle be within the other, it will be an ellipse; and if they intersect each other it may be either an ellipse or hyperbola, according to the kind of contact which is contemplated. The same consideration will also give origin to different hyperbolas or ellipses in the cases in which the circles are external to each other, or in which the one is contained within the other.

&c.; and the author's reasons do not satisfy us as to the propriety of the title, "Algebraic Geometry." Notwithstanding these trivial matters, however, we consider the work written with taste, and, with very few exceptions, in a style, which is good and correct, and very appropriate to the subject.

Before concluding, we shall lay before our readers one other extract from the work before us, on account of its connexion with the general nature of the present paper. After giving the account which we have already quoted, of the great improvements in the under-graduate course, the author thus proceeds:—

> "The course of science read by the candidates for Fellowships has also advanced, but not nearly in the same proportion; and it is to be feared, that, until some change takes place in the manner of conducting the examination for Fellowships, there can be but little hope of improvement. This is a *vivâ voce* examination held in the Latin language. The object being to ascertain the knowledge which the candidates have acquired in the different departments of science and literature, it would appear that the medium of communication between the examiners and candidates ought to be that which would be most readily and clearly apprehended by both; and, therefore, that the English language would be much preferable to any other. For, whatever facility may be acquired in speaking a foreign, not to mention a dead language, no one will have the hardihood to assert that it can ever be spoken as freely and fluently as our native tongue. Waiving, however, for a moment, the objection to the language, concerning which, there may possibly exist some difference of opinion, what reason can there be given for the exclusion of writing? Will it be credited abroad, that in the University of Dublin, at the election of Fellows, there is actually held an oral examination in Physics and Mathematics, without any use whatever of writing? The development of a function, by the theorem of Taylor or Lagrange, or the integration of a differential equation, effected *vivâ voce*, and in Latin, are probably phenomena new to the learned world! It is unnecessary to extend our observations on this subject further, as its absurdity is so very apparent, that the strongest exposure which can be given to it, is a simple statement of the fact."

In these remarks, which are made with such clearness and force, we perfectly concur. We are quite at a loss to discover any good reason for conducting the fellowship examinations in Latin, when all the preceding ones are in English. By this means, the candidate, without any previous practice, is called on to employ a dead language, at that examination, at which, from its extreme importance, both he and his examiners should have it in their power to express themselves, not in barbarous Latin, but in the clearest manner in their native tongue. We are persuaded also, that by the use of writing, the real knowledge of the candidate, in all the more complicated investigations in science, would be much more satisfactorily ascertained; while, in other cases, the oral examination might still be employed. The exclusion of writing on these occasions, is in accordance with what we have already mentioned as a great defect of the College, the want of attention to composition in English. The practice of writing, and attention to style, should be carefully fostered, and should be made an indispensable part of the under-graduate course. If this were done, the Students, on leaving College to become clergymen and lawyers, would be able to express themselves before an audience, with more ease, elegance, and effect; and the person who might wish to become author, would have great advantages, compared with those afforded by the present system.

From what has been said, it will appear, that science has lately been making unwonted advances in our country. The works of the best writers of modern times, are now read and understood; and such an impulse is given to the study, as is capable of producing still greater effects. Let the men of science not relax in their exertions; and may no unseen obstacle oppose itself, to check the progress of the human mind, in this country, in one of its noblest spheres of action!

SKETCHES OF THE HISTORY OF THE REFORMATION IN IRELAND.

No. II.

In the last Number, a summary was given of the measures adopted by Henry VIII. for extending the Reformation to Ireland; and a glance was taken at the difficulties which stood in the way of such a project. A detailed account of the opposition which it encountered, and of the exertions made for its support during Henry's reign, will form the subject of the present article.

The first annunciation of Henry's religious innovations, was received by the generality of the clergy and people of Ireland with astonishment and horror. The profound ignorance in which all classes were involved, had the effect of producing a slavish subjection to the authority of the Roman Pontiff. For though ignorance has been unjustly denominated the mother of devotion, there can be no doubt that she is the parent of superstition. Another circumstance operated strongly, in Ireland, against Henry's claim to a supremacy in religion. The island had long been considered as the inheritance of the Pope, being regarded as an appendage to the church of St. Peter. Acting upon this supposed prerogative, a former Pope had conferred the kingdom upon Henry II. In several Acts of Parliament, and particularly in one passed in the 7th year of the reign of